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| **Source:** | Symmetricom |
| **Title:**  | Time Holdover for Unassisted Oscillators |
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| Please don’t change the structure of this table, just insert the necessary information. |

Abstract

This contribution presents material on the ability of particular oscillator types to maintain time accuracy during holdover.

References

[1] *"Time and phase synchronization aspects of packet networks"*, ITU-T Recommendation G.8271, 02/2012

[2] *"Time and phase synchronization aspects of packet networks: Amendment 1"*, draft Amendment 1 to Recommendation G.8271, Geneva, July 2013

[3] *" Timing characteristics of primary reference clocks"*, ITU-T Recommendation G.811, 09/1997

[4] *"Timing requirements of slave clocks suitable for use as node clocks in synchronization networks"*, ITU-T Recommendation G.812, 06/2004

[5] *"Timing characteristics of SDH equipment slave clocks (SEC)"*, ITU-T Recommendation G.813, 08/1996

[6] *"Synchronization Interface Standard"*, ATIS 0900101.2006

**Discussion**

Clause 6 of G.8271 [1] which was updated in G.8271 Amendment 1 [2] contains a table outlining time requirements for a number of applications. The updated table is reproduced here:

**Table 1/G.8271 – Time and Phase requirement classes**

|  |  |  |
| --- | --- | --- |
| Level of Accuracy | Time Error requirements(Note 1) | Typical Applications(for Information) |
| 1 | 500 ms | Billing, Alarms |
| 2 | 100 s  | IP Delay monitoring |
| 3 | 5 s | LTE TDD (large cell) |
| 4 | 1.5 s | UTRA-TDD, LTE-TDD (small cell)Wimax-TDD (some configurations) |
| 5 | 1 s  | Wimax-TDD (some configurations) |
| 6 | < x ns (x ffs) | Location Based services and some LTE-A features(Note 2) |

ITU-T Recommendations G.812 [4] and G.813 [5] specify the characteristics of a number of clock types, including holdover. These clocks and the G.811 PRC [3] are summarized in a table taken from ATIS 0900101.2006 [6] which is also reproduced here:



The holdover numbers can be used to derive figures for how long a holdover period it takes to produce a particular time error and what time error is produced for a particular holdover period.

*Table 1: Time to Produce a Particular Error for Various Oscillator Types*



*Table 2: Error Produced in a Particular Time for Various Oscillator Types*



Note that figures for the G.811 clock and the cesium clock (1E-12) (the latter represents typical cesium clock performance) are calculated without applying any correction to the offset. A slave clock in holdover typically applies offset correction.

Proposal

This material is proposed for the G.8271 living list.

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